

REMARKS

Claims 1, 3-5, 7-18, and 20-30 were pending in the application. By this paper, Applicant has amended Claims 1, 7, 8, 9, 10, 11, 13, 14, 15, 21, 27, and 30, and added new Claim 31. Accordingly, Claims 1, 3-5, 7-18, and 20-31 are presented herein for examination.

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*In the Drawings*

In response to page 2, Par. 2 of the Office Action, Applicant submits herewith drawings in compliance with 37 CFR. 1.121(d). Applicant submits that these drawings overcome the Examiner's objections, and requests that all such rejections be withdrawn. Applicant notes that these drawings are, as of the date of this response, still being formalized; hence the attached drawings should be considered informal. Finalized formal drawings will be submitted to the Official Draftsperson at the earliest opportunity.

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*Allowed/Allowable Subject Matter*

15 Per Par. 15 of the Office Action, Claims 28 and 29 stand allowed.

Per Par. 14 of the Office Action, Claim 9 was objected to as being dependent on a rejected base claim, but would be allowable if rewritten in independent form including base and intervening claim limitations. By this paper, Applicant presents new Claim 31 for examination, which relates to the subject matter of Claim 9 (and its base and any intervening claims). Applicant therefore submits that Claim 31 defines patentable subject matter, and is in condition for allowance.

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*§112 Rejections*

By this paper, Applicant has amended Claims 8, 10, and 27 to include limitations relating to analyzing, estimating, or projecting pulse dispersion. Support for this amendment can be found, *inter alia*, at page 29, lines 10-13 of the specification as filed, which states:

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*"Hence, the transmission of pulse groupings may be synchronized (accounting for propagation delays and leading/trailing pulse dispersion) such that the arrival of a given pulse grouping coincides with the read-out from the buffer of the prior grouping."* {Emphasis added}

Appl. No. : 10/059,580  
Filed : January 28, 2002

Applicant submits that these amendments overcome the Examiner's Section 112(1) rejections as set forth in Par. 4 of the Office Action.

Furthermore, Applicant has herein amended Claim 21 to correct the deficiencies cited in Pars. 5-6 of the Office Action, thereby overcoming these rejections.

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*§102 Rejections*

**Claims 1, 7, 27 and 30** - By this paper, Applicant has amended independent Claims 1, 7, 27, and 30 to include limitations relating to use in a data network used to transfer a plurality of data bits from one location to at least one second location, the second location being distant from the first location. Support for these limitations is replete throughout Applicant's specification as filed.

Applicant submits that Liu, et al. in no way teaches or suggests a data network of any kind, let alone transmission of data across long distances. Applicant further respectfully traverses the Examiner's assertion that "qubits" or quantum bits necessarily comprise binary data bits sent over a communication system. To the contrary, Liu is clearly talking about information processing at a quantum level within the cloud (Bose-Einstein condensate):

*"We believe that this system could be used for quantum information transfer; for example, to inter-convert stationary and flying qubits<sup>15</sup>. By injection of multiple probe pulses into a Bose-Einstein condensate—where we expect that most atomic collisions are coherence-preserving—and with use of controlled atom-atom interactions, quantum information processing may be possible during the storage time." {Emphasis added}*

This is a very different thing from *transferring* a plurality of data bits from one location to at least one second location (e.g., across a network), the second location being distant from the first location.

Furthermore, not only does Liu not provide any suggestion to combine existing data networks with its teachings, it actually teaches away from the claimed inventions, since the type of quantum processing theorized by Liu cannot occur over large distances. **Liu is talking about information processing within the cloud, not transmission across a network.**

Accordingly, Applicant submits that Claims 1, 7, 27, and 30 as amended herein, and hence all other claims that depend directly or indirectly therefrom, are novel and non-obvious over Liu, et al.

**Claims 1 and 11** - Regarding Eberly (U.S. 4,406,003), Applicant submits that Eberly in no way teaches or suggests storing quantum state information in the medium that can be subsequently read out therefrom. Respectfully, Applicant has read the portions of Eberly cited by the Examiner on page 7 of the Office Action, and still sees no support for the Examiner's assertions in this regard. Eberly is merely teaching the excitation of a medium to cause excited (elevated) quantum states; a common laser does this. This is clearly distinguishable from storing quantum state information in the medium that can be subsequently read out therefrom. Applicant refers the Examiner to page 2 of its specification, where this feature is discussed:

*"It has further been experimentally demonstrated that multiple such "read-outs" of a stored pulse can be achieved through the application of a series of short, coupling laser pulses (see, e.g., Fig. 4a and 4b of Liu cited above). As illustrated in Figs. 4a and 4b of Liu, measurements of multiple (e.g., double and triple) pulse read-outs spaced by up to hundreds of microseconds may be produced using the aforementioned techniques. Advantageously, each of the regenerated probe pulses in such multiple readouts contains a portion of the contents of the atomic memory, notably in the form of energy (i.e., the total energy of the multiple pulses is equivalent to that for a single read-out pulse obtained using a longer coupling laser pulse). Successive depletion of the "quantum memory" occurs for each successive pulse."*

Eberly provides no such teaching or functionality. To the contrary, Eberly teaches a system and method wherein light "pulses" of differing wavelengths are passed through a medium so as to cause them to travel at the same speed, which is reduced from their normal propagation speed:

*"In accordance with the invention, a number of different pulse beams, each at a different wavelength (e.g., different colors for optical pulses) and/or polarization may be caused to travel at the same speed, rather than at different speeds for each wavelength. In accordance with the invention, also, the transmission properties are different when some pulses (e.g., some of the colors) are absent and when some of the pulses are present." Col. 1, lines 18-25 {Emphasis added}*

Eberly does not appear to teach or suggest storage of quantum state information in the medium itself (e.g., for a period of time), and subsequent readout therefrom. Herein lies a fundamental distinction between Eberly and Applicant's invention of Claim 1; i.e., **Eberly merely seeks to match the propagation speeds of different (chromatic) pulses through the medium, whereas**  
5 **Applicant's claimed invention stores state information in the medium for subsequent readout.**

Applicant further notes that Eberly clearly teaches away from combination with Liu, since, *inter alia*, Eberly teaches heating (excitation) of its medium, which would not permit storage of quantum state information for a period of time as in Applicant's invention.

10 *"The medium can be excited, so that its energy levels are populated to some degree, by an excitation unit 14 such as a heater or a flash lamp or another laser." Col. 3, lines 52-54 {Emphasis added}*

15 Applicant further notes that Eberly teaches nothing of a data network as now recited in Applicant's Claims 1 and 11. The portions cited by the Examiner as teaching a communication system in no way explicitly or inherently teach, or even remotely suggest, a data network or transmission over substantial distances.

20 Accordingly, Applicant submits that Claims 1 and 11 as amended herein are neither anticipated nor rendered obvious by Liu or Eberly, taken alone or in combination.

### *§103 Rejections*

**Claim 15** –Applicant has herein amended independent Claim 15 to include limitations relating to transmission across a data network. Applicant submits that none of the cited art (Liu,  
25 Eberly, or Jewell) teaches or suggests anything regarding a network.

Accordingly, any combination of these references alone cannot as a matter of law render Applicant's invention of Claim 15 obvious, since not all limitations are taught or inherent in the art.

Appl. No. : 10/059,580  
Filed : January 28, 2002

*Other Remarks*

Applicant hereby specifically reserves the right to appeal (including Pre-Appeal Brief under the Pilot Program), and to prosecute claims of different or broader scope in a continuation or divisional application.

5 Applicant notes that any claim cancellations or additions made herein are made solely for the purposes of more clearly and particularly describing and claiming the invention and responding to the aforementioned restriction election, and not for purposes of overcoming art or for patentability. The Examiner should infer no (i) adoption of a position with respect to patentability, (ii) change in the Applicant's position with respect to any claim or subject matter  
10 of the invention, or (iii) acquiescence in any way to any position taken by the Examiner, based on such claim cancellations or additions.


Furthermore, any remarks made with respect to a specific claim or claims shall apply only to such claim or claims.

If the Examiner has any questions or comments that may be resolved over the telephone,  
15 he/she is requested to call the undersigned at (858) 675-1670.

Respectfully submitted,

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